Chapter 11

Boresighting and Calibration Devices

Boresight devices allow the crew to boresight weapon systems and the calibration devices and check the accuracy of the fire control system. These devices improve the accuracy of various tank weapon systems, as well as save ammunition, range time, and training time.

Boresight Devices

M26A1 AND M27A1 MUZZLE BORESIGHT DEVICES

The M26A1 MBD is used to boresight the 105-mm gun. The M27A1 MBD is used to boresight the 120-mm gun. The only difference between the two is in the expanding adapter collet. The adapter collet for the M27A1 is larger to accommodate the 120-mm gun (see Figure 11-1).

These devices are 10X magnification telescopes. They have the following components:

- A right-angled eyepiece assembly with diopter adjustment.
- A reticle illumination port for night operations.
- An expanding adapter operating handle for operation of the 105-mm or 120-mm expanding adapter collet.
- A 105-mm or 120-mm tapered muzzle cone to center the device in the end of the gun.
- A 105-mm or 120-mm expanding adapter collet with expanding fingers to ensure centerline location in the gun.
- Reticle adjustment screws.
- A rotating protective shroud for the reticle adjustment screws.
- Purge valve and a purge bleed screw.

Note. The M26A1 and M27A1 MBD may have either three or four reticle adjustment screws.

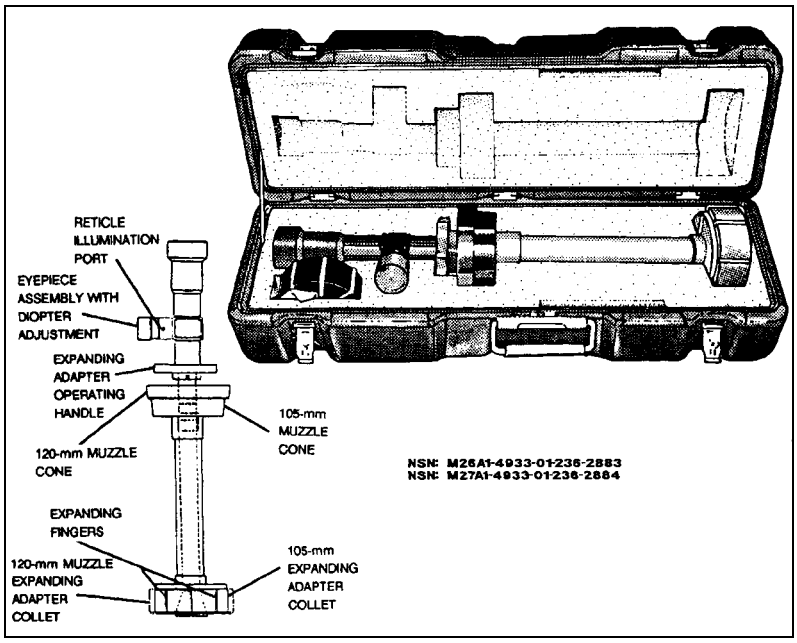


Figure 11-1. M26A1 and M27A1 MBD.

M26A2 AND M27A2 MUZZLE BORESIGHT DEVICES

The M26A2 MBD is used to boresight the 105-mm gun. The M27A2 MBD is used to boresight the 120-mm gun. The only difference between the two is in the pinned expanding adapter collet. The adapter collet for the M27A1 is larger to accommodate the 120-mm gun (see Figure 11-2).

These devices are 10X magnification telescopes. They have the following components:

- A right-angled eyepiece assembly with diopter adjustment.
- A reticle illumination port for night operations.
- An expanding adapter operating handle for operation of the 105-mm or 120-mm pinned, expanding-adapter collet.
- A 105-mm or 120-mm tapered muzzle cone to center the device in the end of the gun.
- A 105-mm or 120-mm pinned, expanding-adapter collet with expanding fingers to ensure centerline location in the gun.
- A torque indicator plate for use during boresighting procedures.
- Azimuth and elevation reticle adjustment knobs to collimate the MBD to a particular gun tube.

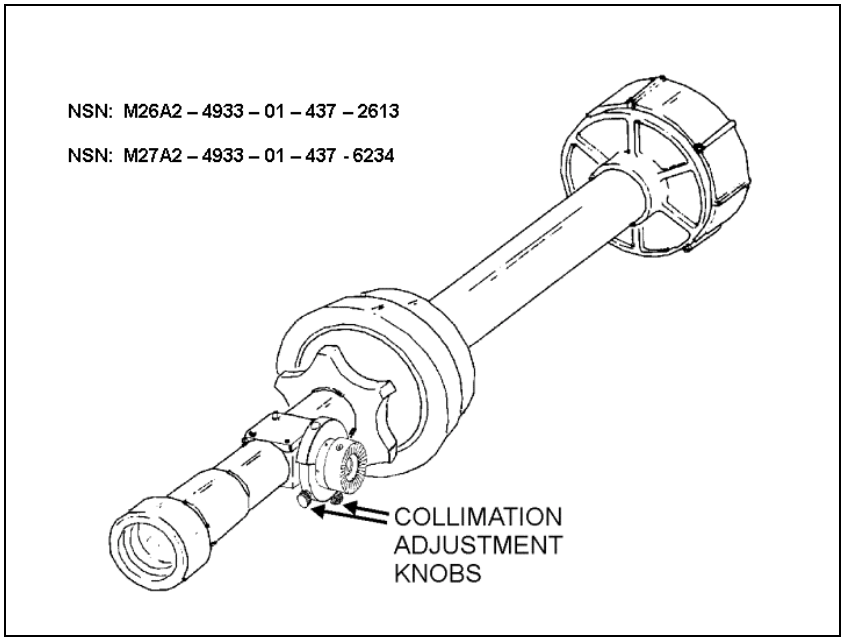


Figure 11-2. M26A2 and M27A2 MBD.

LENZAR MBD (KIT BORESIGHT DEVICE, CALIBER .50)

The Lenzar MBD is used to boresight the M2 HB caliber .50 machine gun. It can also be used to boresight the M240 machine gun in the commander's weapon station. The device is a 5X magnification telescope. When properly installed into the muzzle end of the machine gun, the sighting piece is positioned at 12 o'clock. There are two focus adjustments knobs, a reticle focus for the cross hairs, and an objective focus for the target (see Figure 11-3).

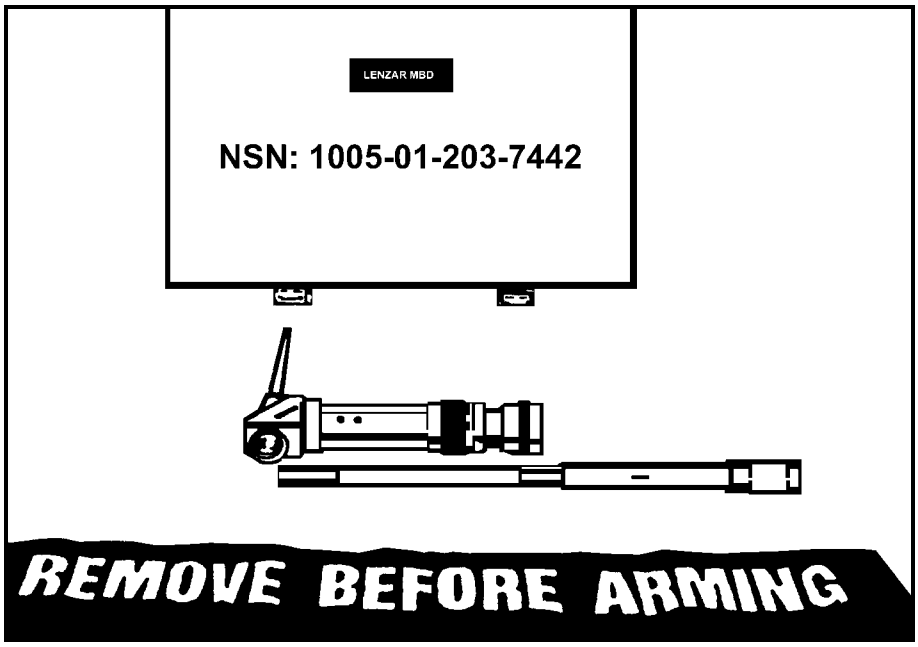


Figure 11-3. Lenzar MBD (Kit Boresight Device, Caliber .50).

Calibration Devices

Calibration devices are needed to test the tank's fire control system and check for boresight accuracy. The various calibration devices discussed in this chapter are the ballistic solution boards, boresight panel, screening test targets, and proofing test panel.

BALLISTIC SOLUTION BOARDS

A ballistic solution board is used to check that the tank's fire control system is correctly implementing ballistic solutions in all main gun channels. Ballistic solution boards are made from plywood. They are maintained at unit level. The board must be placed 100 meters (plus or minus 1 meter) from the vehicle's front slope at the same height as the tank gun trunnions. All solution boards have the following standard features:

- Gunner's primary sight gun/sight boxes are 12 inches by 12 inches.
- Solution rectangles are 2 inches wide and 4 inches high. Each has a 6-inch horizontal line and an 8-inch vertical line through its center.
- Solution board lettering or numbering is at least 4 inches high.
- Distances between lettering or numbering and the solution board rectangles or sight, ammunition, gun, or GPS boxes are 2 inches.
- Boards are standard black and white.

COMBINED SOLUTION BOARDS

Previously, units needed two solution boards to complete Armament Accuracy Checks 4 and 5. Reports from units in the field indicate that combining the solution boards for Checks 4 and 5 simplifies the procedures. The Abrams Combined Solution Board also reduces the space needed to transport the boards for field use (see Figure 11-4).

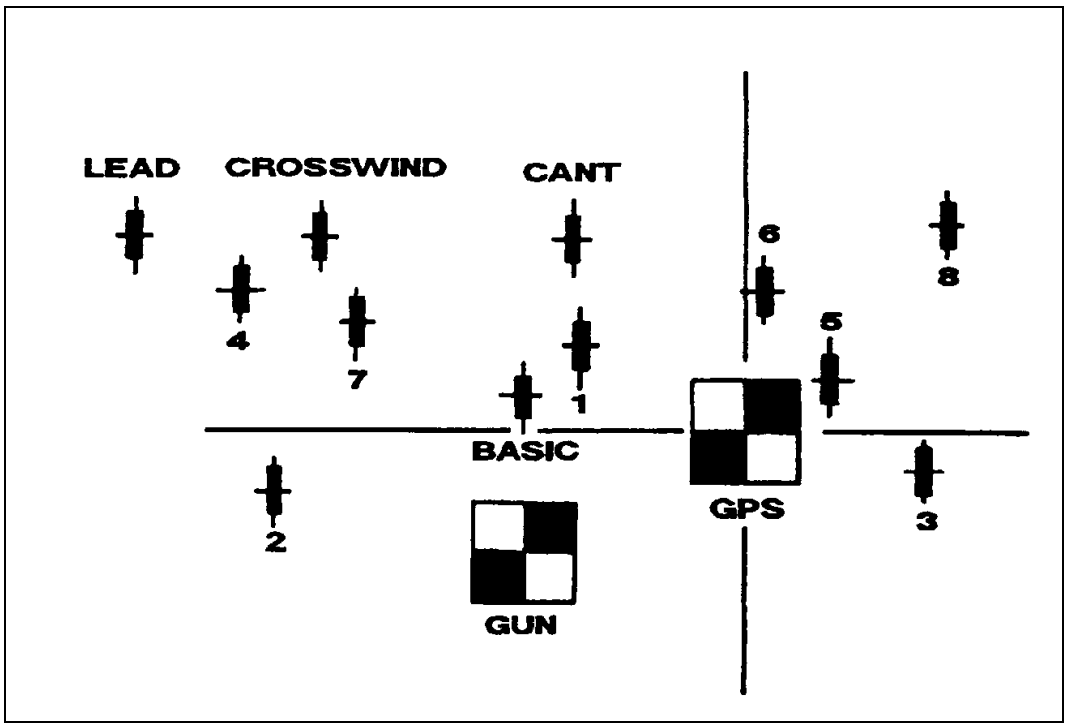


Figure 11-4. Sample Abrams combined solution board.

DIMENSIONS OF THE COMBINED SOLUTION BOARD

- Minimum solution board dimensions are 96 inches wide by 60 inches high.
- GUN and GPS squares are 12 inches on each side. The upper right and lower left quadrants are dark colored.
- The solution rectangles are 2 inches by 4 inches, dark colored, with 6-inch horizontal and vertical lines through the center of each rectangle.
- All lettering is at least 4 inches high.
- Place the center of the GUN target right 48 inches and up 12 inches, from the lower left corner of the solution board.
- All other measurements are from the center of the GUN target:

To center of GPS	Right 22 inches, up 16 inches
To center of BASIC	Right 0 inches, up 19 inches
To center of CANT	Right 6 inches, up 39 inches
To center of CROSSWIND	Left 24 inches, up 39 inches
To center of LEAD	Left 46 inches, up 39 inches
To center of rectangle 1	Right 3 inches, up 26 inches
To center of rectangle 2	Left 33 inches, up 7 inches
To center of rectangle 3	Right 43 inches, up 12 inches
To center of rectangle 4	Left 38 inches, up 32 inches
To center of rectangle 5	Right 32 inches, up 20 inches
To center of rectangle 6	Right 24 inches, up 32 inches
To center of rectangle 7	Left 22 inches, up 29 inches
To center of rectangle 8	Right 46 inches, up 42 inches

Note. When constructing a combined solution board, all measurements must be accurate. Inaccurate measurements will result in false test results.

DATA SHEETS

Data sheets are used by the crew to record the exact lay of the gun while performing AACs. See Figures 11-5 through 11-7 for samples of data sheets for checks 4 and 5 on the M1, M1A1, and M1A2 tanks.

Note. Each data sheet has multiple rectangles for some numbers on the board. This is for use when a particular rectangle is used more than once. For example, on the M1 AAC board (Figure 11-5), rectangle 6 is used with SUBDES 1 and 0.

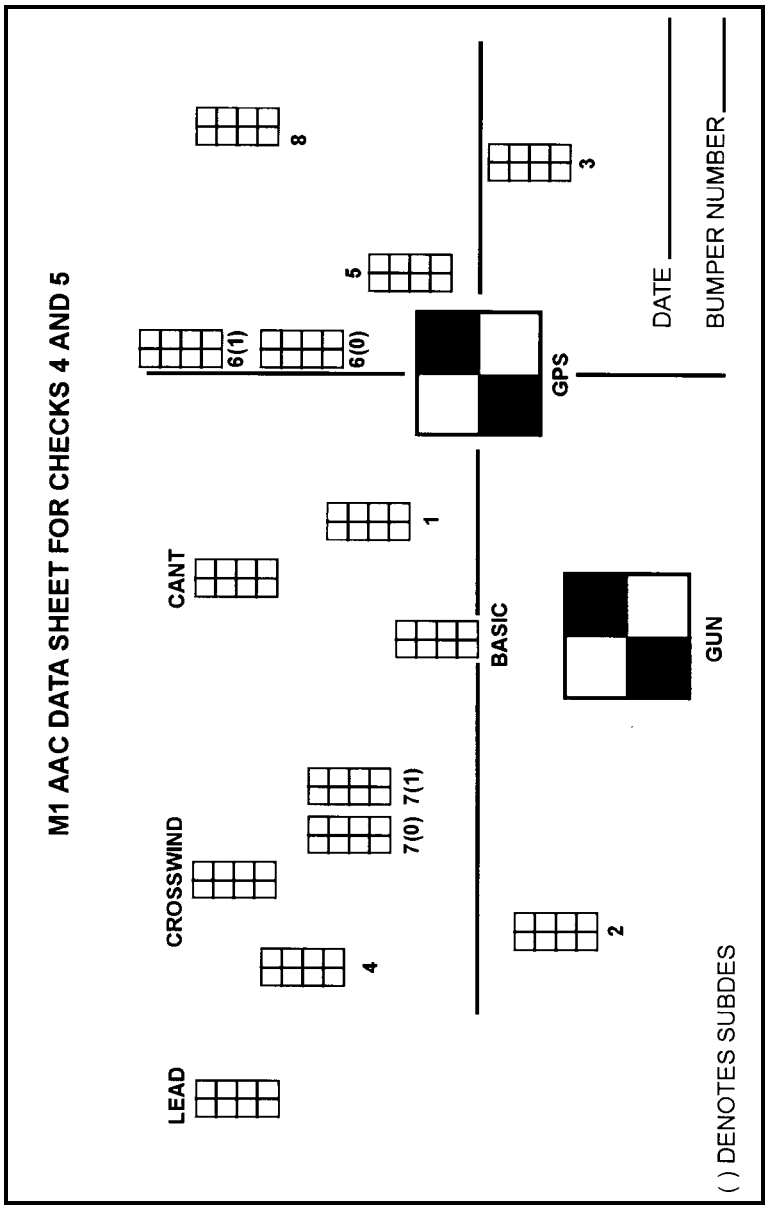


Figure 11-5. Sample M1 data sheet for armament accuracy checks 4 and 5.

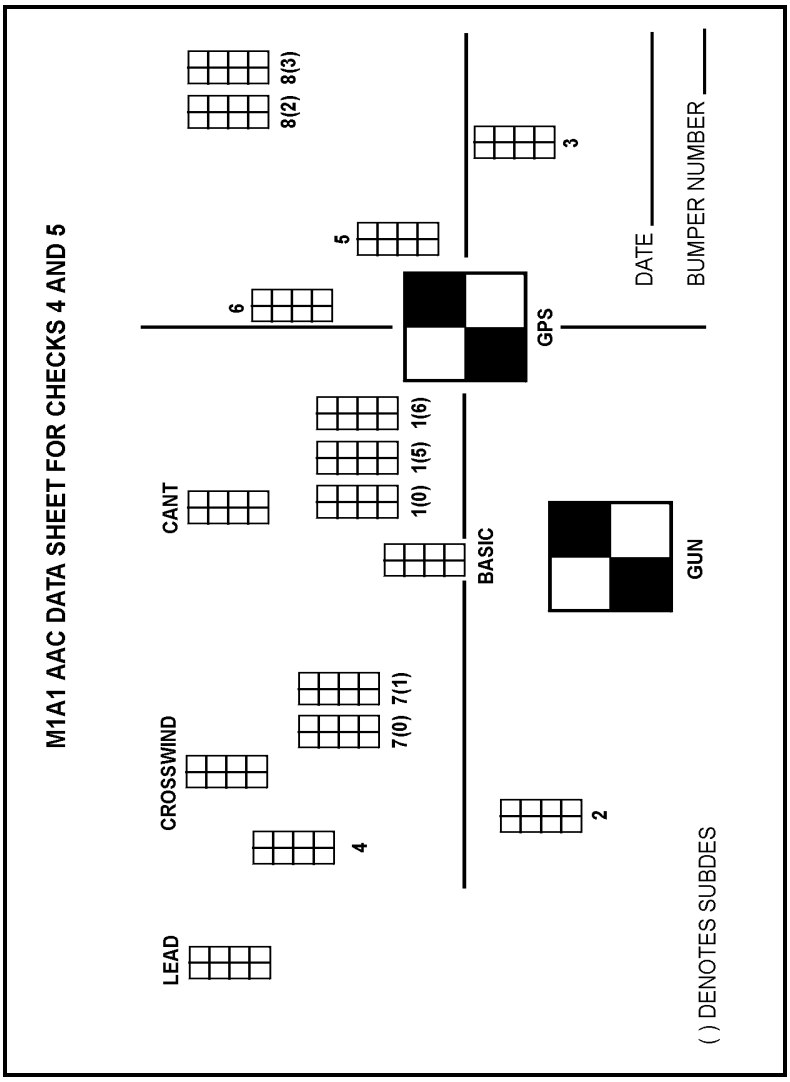


Figure 11-6. Sample M1A1 data sheet for armament accuracy checks 4 and 5.

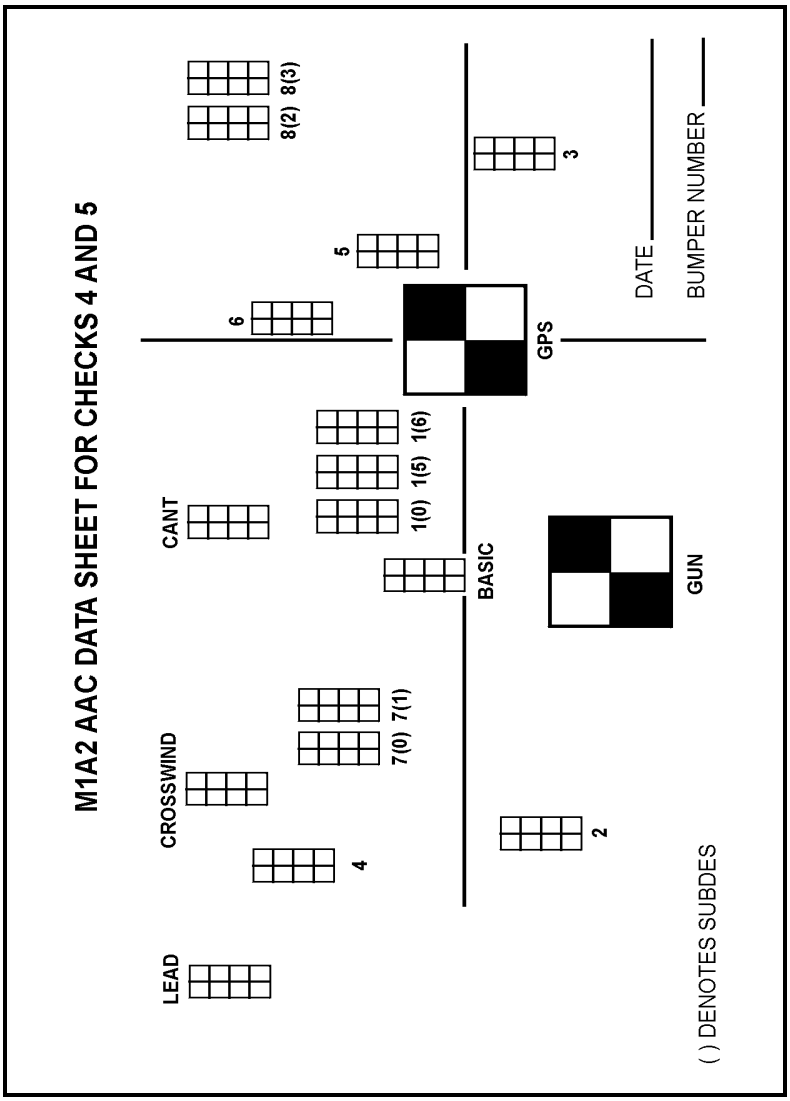


Figure 11-7. Sample M1A2 data sheet for special input and ballistic solution checks.

BORESIGHT PANEL

It is impossible to fire accurately without sight alignment; therefore, boresighting using the boresight panel at a known range is fundamental to tank gunnery. The boresight panel is used with standard boresighting procedures for all tank systems. It measures 6 feet square. It has defined aiming points on one edge or in the center (see Figure 11-8). Lights and a thermal marker should be used to define the aiming points on the panel.

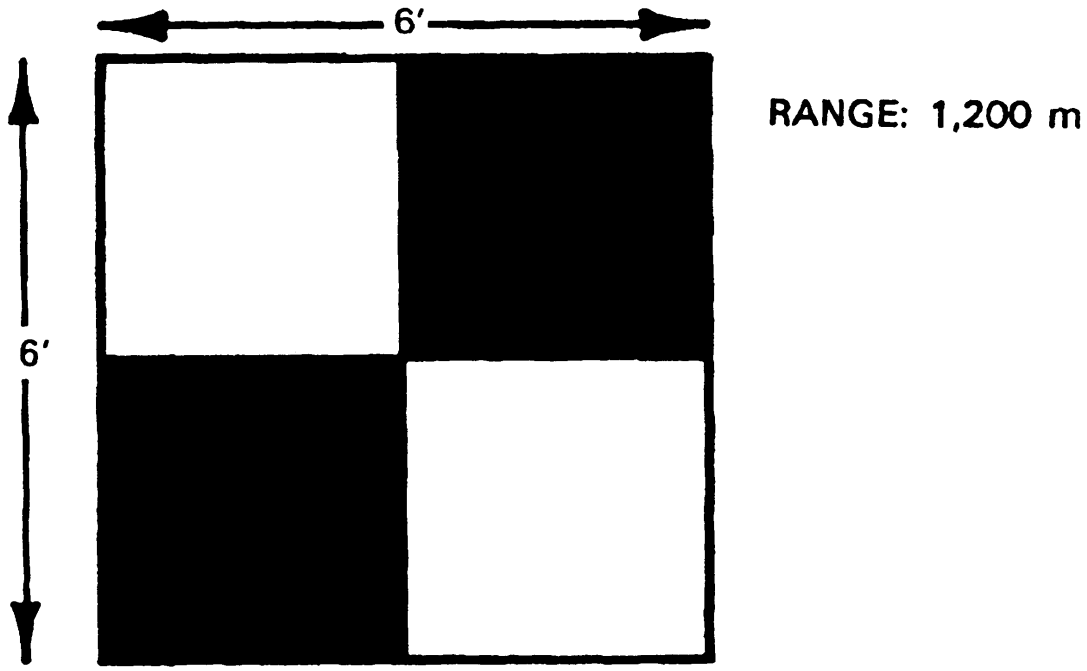
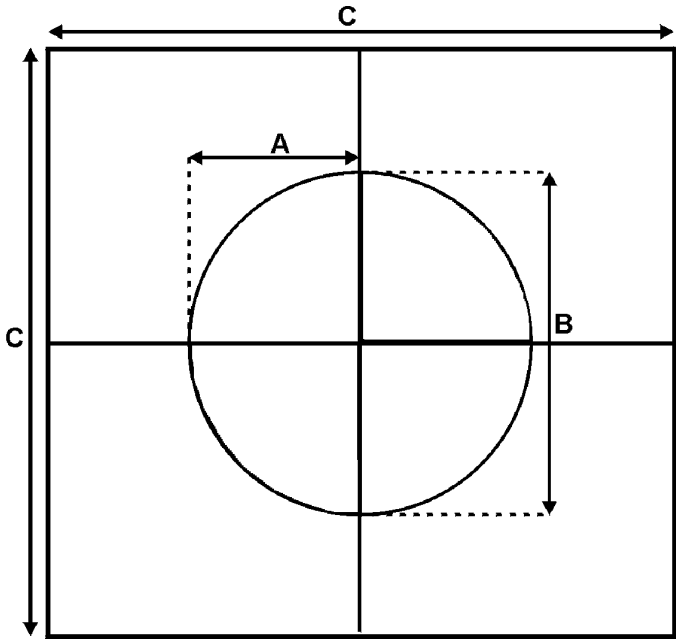


Figure 11-8. Standard boresight panel.

SCREENING TEST TARGET (ST-5)

The screening test target is used during an LFAST to confirm fire control system accuracy (see Figure 11-9).



RANGE	DIMENSIONS OF SCREENING TARGETS 120mm		
	A	B	C
1500m	87.5cm	175cm	10ft X 10ft
1400m	81.7cm	163.3cm	*9ft 4in X 9ft 4in
1300m	75.8cm	151.7cm	*8ft 8in X 8ft 8in
1200m	70.0cm	140.0cm	*8ft X 8ft
1100m	64.2cm	128.3cm	*7ft 4in X 7ft 4in
1000m	58.3cm	116.7cm	*6ft 8in X 6ft 8in
900m	52.5cm	105.0cm	*6ft X 6ft
800m	46.7cm	93.3cm	*5ft 4in X 5ft 4in
700m	40.8cm	81.7cm	*4ft 8in X 4ft 8in
600m	35.0cm	70.0cm	*4ft X 4ft
500m	29.2cm	58.3cm	*3ft 4in X 3ft 4in
*Sizes shown are the minimum for the background board.			

Figure 11-9. Screening test target (ST-5), 1,500 meters.

Note. For the 105mm main gun, the screening panel is placed at 1,200m and is the same dimension as the 120-mm panel at 1,500m.